Ion Propulsion Related Plasma Physics Investigations from Deep Space 1

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Ion propulsion will be used for the first time on an interplanetary spacecraft, the New Millennium Deep Space One (DS1), scheduled for launch in October 1998. A primary objective of New Millennium DS1 is to flight validate solar electric propulsion (SEP) for interplanetary missions. The cruise phase of the mission will characterize the life and performance of a 30 cm xenon ion thruster and determine how its operation may affect spacecraft payloads and critical subsystems.

As the effects introduced by ion thruster operation have long raised both technology and science concerns, one of the major investigations from DS1 will be to understand and characterize the ion thruster induced plasma interactions and their effects. This paper presents an overview of this investigation. We present an overview of our current understanding of ion thruster plume induced plasma interactions. We discuss theoretical models for both near-spacecraft ion thruster plume and far-field plume ion-solar wind couplings. We discuss first observational results from the DS1 spacecraft.

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